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The US EPA Waste Minimization Research Program

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The US EPA Waste Minimization Research Program

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Abstract

A program to encourage the development and adoption of new production and recycling technologies that result in the production of less hazardous waste was initiated by the U.S. EPA's Office of Research and Development in 1987. The program includes a broad spectrum of demonstration and evaluation audit studies, technical assistance and long term research studies. It is designed to supplement and support the EPA's waste minimization strategy being carried out by the Office of Solid Waste.

Reducing the generation of hazardous wastes can be achieved in many ways. Process chemistry can be changed; potential waste streams can be recycled within a manufacturing process or back into the process; process technology and/or equipment can be modified to produce products more efficiently, resulting in less waste; plant operations, i.e., "housekeeping" methods, can be changed or controlled to produce fewer and smaller waste streams of less waste in general; changes in raw materials (feedstocks) can lead to fewer waste streams or less-hazardous waste streams; finally, changes in the end products from manufacturing operations can, in some instances, be made so as to affect the types and quantities of wastes emitted. The early introduction of these and other waste reduction techniques into broad commercial practice is one of the objectives of the Waste Minimization Research Program.

In this paper the author reviews progress to date of the various elements of the program and discusses the results of selected waste minimization audit studies sponsored by the Agency.

The US EPA Waste Minimization Research Program

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Introduction

In 1986 the US EPA submitted a Report to Congress on the Minimization of Hazardous Waste(1). In this report, which was submitted in response to the 1984 Hazardous and Solid Waste Amendments to the Resource Conservation and Recovery Act (RCRA), the Agency found that "aggressive action in favor of waste minimization is clearly needed..." Subsequently, the Agency has undertaken to develop a program that includes among several elements, a waste minimization research program to encourage the development and adoption of production and recycling technologies that result in less waste being generated. A description of that program and a discussion of some of the projects in the program are the subject of this paper.

WMR Program Overview

The overall purpose of the waste minimization research (WMR) program is to facilitate the identification, development, and adoption of production and recycling technologies that result in reducing the generation of hazardous wastes. The program is intended to contribute and to support other waste minimization activities within the EPA that are designed to encourage waste minimization.

Although 1988 is the first year that the Agency has supported a program specifically identified as a waste minimization research program, it has in the past supported several projects that can be appropriately categorized as waste minimization research. In 1987 the HWERL published the results of a rather extensive project to document the advantages of incorporating selected recycling and treatment technologies in the printed circuit board industries(2). Two of the case studies evaluating the use of sodium borohydride reduction as a substitute for lime/ferrous sulfate precipitation, found that the technology was a

viable substitute in one case and was marginally acceptable in another. Another case study, involving carbon adsorption removal of organic contaminants from plating bath wastes, found that this technology significantly reduced both disposal costs and waste volume. A final case study of electrolytic recovery indicated that while acid copper electroplating rinses are amenable to electrolytic recovery, other metal-bearing rinses, such as those from solder (tin/lead) plating or etching are less appropriate.

The HWERL has developed a generic EPA manual for conducting waste minimization assessments. (3) An outline of the recommended procedure is shown in Figure 1. The agency supported the demonstration of the recommended procedure in selected waste generating facilities. Summaries of those studies are shown in Table 1.

Figure 1.
THE WASTE MINIMIZATION ASSESSMENT PROCEDURE

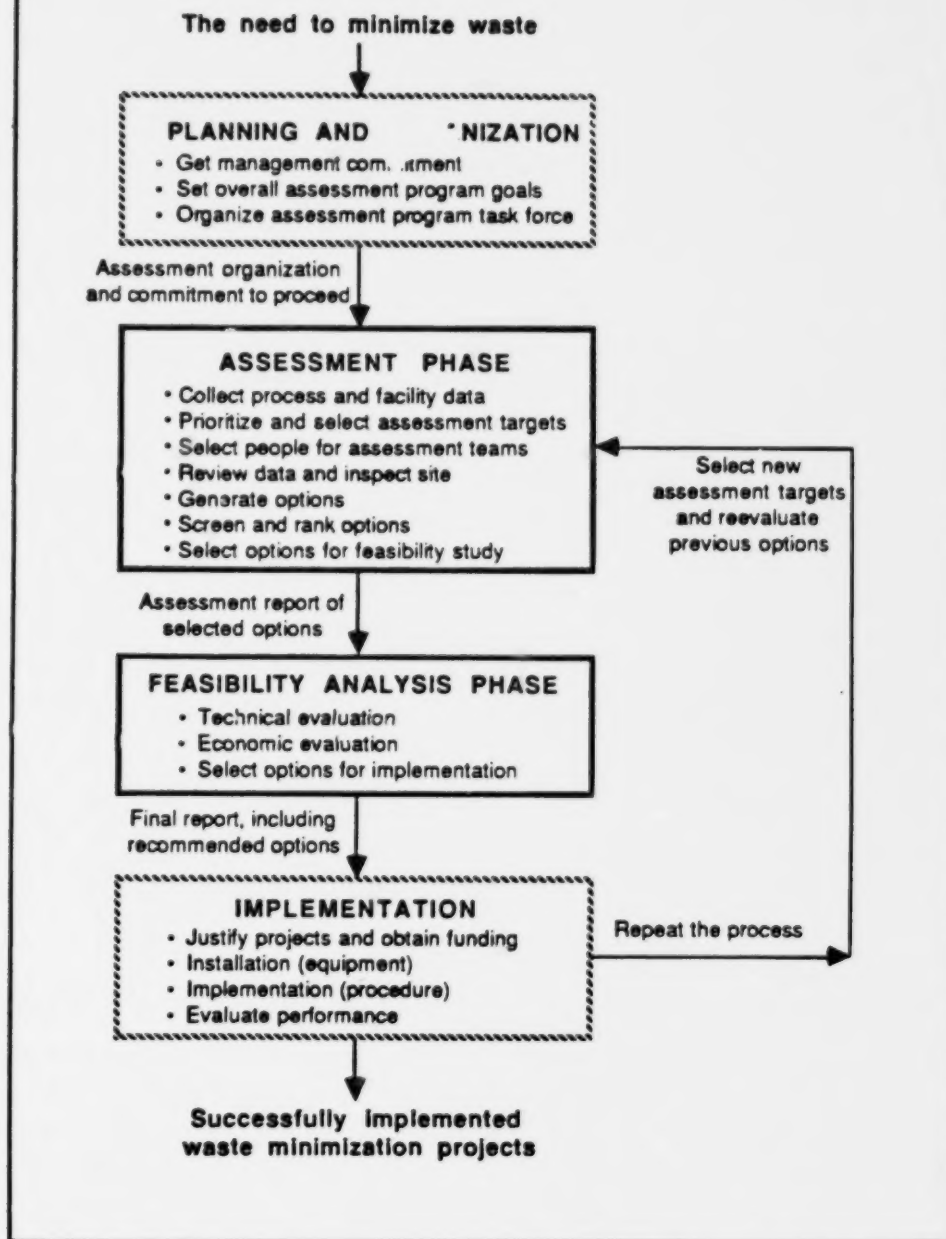


Table 1

Selected Summaries of Waste Minimization Assessment Case Studies

Case 1 - Specialty steel making complex

A technically and economically feasible recycling option for the recovery of fluorspar (calcium fluoride) from a nitric/hydrofluoric acid pickling waste water stream was identified. Use of the WM option would result in savings of \$168,000 and a 30 percent reduction in final waste disposal volume.(4)

Case 2 - Solvent using industries

Audits were carried out at two facilities, an aircraft equipment facility and a ceramic capacitor manufacturer. At the first facility such source control options as counter current cleaning, installation of a level alarm, and periodic sludge removal had payouts of less than 3 years. At the second facility, the most cost effective options identified were to standardize solvents, to use metal mesh type filters, and to install a common batch solvent recovery still. This last option had a payout of - .9 years and reduced waste solvent generation by 50% annually.(5)

Case 3 - Electroplating operations)

WM audits were conducted at two electroplating facilities generating cyanide - bearing wastes. At the first facility, WM options determined to have less than a 3yr payback were use of drain boards to reduce drag-out, still rinsing to recover drag-out and spray rinsing. Cost effective options for the second facility were determined to be use of drain boards, and bath life extension through use of deionized water.(6)

Table 2

US EPA/California DOHs Waste Minimization Assessment Manuals

- | | |
|-------------------------------|--|
| . Pesticide Formulators | . Photographic Processing Labs |
| . Paints & Coatings | . Commercial Printing |
| . Circuit Board Manufacturers | . Educational, Scientific, & Research Institutions |
| . Automotive Repairs | . Hospitals |
| . Automotive Paint Shops | . Fiberglass & Rigid Plastic Products |

In cooperation with the California Department of Health Services the EPA is presently supporting two significant efforts in the area of waste minimization. The first is the development of industry-specific waste minimization assessment manuals (See Table 2), and the second is a project to estimate the potential for reducing halogenated organic waste streams in the Los Angeles area(7). The assessment manuals incorporate the format of the recommended EPA procedure for conducting waste minimization assessments. The manuals will be available by the fall of 1988, and the halogenated organics project will produce recommendations in the winter of 1989.

Current Expanded Program

Reflecting the increased emphasis being given to waste minimization in the U.S., the HWERL is expanding the WM program. This expanded program is being built on five newly established subprograms as outlined below.

WRITE

The Waste Reduction Innovative Technology Evaluation (WRITE) Program - a program to identify, evaluate and/or demonstrate new ideas and technologies that lead to waste reduction.

The WRITE Program is a program to involve the EPA with private industry to encourage the development and/or demonstration of effective techniques and technology for hazardous waste minimization. The program is based upon the model currently being used in the Agency's Superfund Innovative Technology Evaluation (SITE) Program, i.e., the EPA generally provides funds to support only the evaluation of the demonstration and the generator assumes the costs of carrying out the demonstration.

Typical projects come through contacts with industry associations, state governments, professional associations, or public solicitations. The EPA's contributing support for evaluation expenses depends upon the project's having a wide

applicability and a high chance of success, or upon its innovativeness. Efforts are made to maintain active projects in all of the major waste generating industry sectors.

The WRITE program is based upon the Agency's perception that a significant disincentive to the acceptance of new processes is the lack of credible technical information on the processes. The 1986 EPA Report to Congress states, "Finally the most significant technical barrier to waste minimization may often be a lack of suitable information on source reduction and recycling techniques."

WRAP

The Waste Reduction Assessments Program (WRAP) - a program to demonstrate the EPA Waste Minimization Opportunity Assessment Procedure and encourage the use of waste minimization assessments.

The WRAP program is designed to encourage the use of waste minimization assessment as a tool for identifying operations for reducing waste. It supports activities to demonstrate the procedure in various industrial settings. During 1988 the program includes two major projects, one a cooperative agreement with a research institute to utilize the faculties at several engineering schools in carrying out assessments for small generators, and the other a cooperative agreement with the New Jersey Department of Environmental Protection to support demonstration assessments in many different types of facilities.

WREAFS

The Waste Reduction Evaluations at Federal Sites (WREAFS)- a program to develop cooperative waste minimization technology demonstration projects with other Federal agencies.

The various services within the Department of Defense are among the more active organizations currently pursuing waste minimization as a broad management strategy. Other Federal agencies such as the Department of Energy and the Tennessee Valley Authority are also involved in waste minimization. The manufacturing facilities operated by these agencies are not unlike manufacturing facilities operated by the private sector. Thus, there is significant potential for transfer of technology from Federal sites to

industrial organizations employing the same manufacturing operations.

WREAFS provides a low-cost structure for involving the EPA in a wide variety of projects already being funded by other Federal agencies. The EPA plays the role of information broker and/or advisor for other agencies on project selection, evaluation methodologies and assessment of potential environmental benefits. It is planned to convene a conference in the fall of 1988 to provide a forum for discussion of waste minimization efforts and programs throughout the federal sector.

Sb WRITE

The Small Business WRITE (Sb WRITE) program- a program to encourage the introduction of waste minimization technology at the facilities of small quantity generators. This program is to be done in cooperation with state waste reduction agencies.

The Sb WRITE Program is designed to involve the EPA and cooperating state agencies in efforts to promote the demonstration of waste reduction techniques that are of particular interest to companies that generate less than 1000Kg per month of waste. A typical Sb-Write project consists of the demonstration of a new source reduction technique at a small business, such as an electroplating shop. The state agency would be responsible for the project award and monitoring. It is envisioned that funds provided by the EPA would be leveraged considerably by the state and the involved company. Current plans are to initiate at least one Sb WRITE program in 1988. However, funding of the Sb WRITE Program is still under discussion within the EPA.

WISE - Waste Reduction Institute for Senior Executives - An institute comprised of senior individuals knowledgeable in the principles and practices of waste minimization to act as advisors to the EPA and as liaisons to those generators with whom the Agency is working cooperatively to encourage new waste reduction technologies.

Conclusion

There has been established a program for the EPA to provide technical data to promote a national waste minimization policy, and to provide a technical foundation for furthering the acceptance of technologies that reduce hazardous waste generation. As the U.S. continues to evolve toward production systems that involve more low and nonwaste technologies, it is planned that the EPA's waste minimization research activities will continue to contribute to progress.

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